



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/554,593 | 10/26/2005 | Masaki Hirakata | 125746 | 6661 |
| 25944 7590 12/23/2009 OLIFF & BERRIDGE, PLC P.O. BOX 320850 ALEXANDRIA, VA 22320-4850 | | | | |
| EXAMINER | | | | |
| MILLER, DANIEL H | | | | |
| ART UNIT | | PAPER NUMBER | | |
| 1794 | | | | |
| MAIL DATE | | DELIVERY MODE | | |
| 12/23/2009 | | PAPER | | |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/554,593

Applicant(s)

HIRAKATA ET AL.

Examiner

DANIEL MILLER

Art Unit

1794

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 September 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 3-6, 9-28, 30-35, 37 and 47-56 is/are pending in the application.
- 4a) Of the above claim(s) 20-28, 30-35, 37 and 47-56 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 3-6 and 9-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, and 3-6, 9-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bethune (US 6,472,705) in view of Tennent (US 6,031,711).
3. Bethune teaches a field effect transistor (FET) that can comprise three electrodes and an insulating layer (considered to be a "transporter layer" as claimed) comprising a cage molecule that may comprise single walled or multilayered carbon nanotubes (see claim 4 Bethune) that store at least one electron in order to overcome the gate (electrode) voltage barrier and carry a current between the source (electrode) and drain (electrode) (see figures and abstract and claim 1 Bethune).
4. Bethune does not teach the claimed structure of the nanotube layer.
5. Tennent teaches carbon nanotubes that are functionalized and used as electrodes in capacitors (see abstract and figures 1 and 2). The nanotube layer is used in the capacitor to store electrical energy (electrons) in order to release a charge potential similar to a battery, but with a long life cycle (see background of the invention).

The carbon nanotubes surfaces can be functionalized to form a uniformly chemically substituted moiety on the nanotubes where the functional groups can be one of SH, SO₃H, COOH, NH₂, COOR (see column 15 lines 45-68 and column 16 lines 1-30). The functionalized nanotubes can then be linked together with a cross linking agent into a network structure (column 17 and column 18 lines 5-15). The cross linking agent can be polyols or polyamine (column 18 lines 5-15), which are an exemplary non-self polymerizable cross linking agent as required by applicant's claim 11 (see pages 12-13 examples of preferred non-self polymerizable cross linking agents in the instant specification).

6. Given applicant's teachings from the specification (pages 12-14 and 63-66 instant specification) that when a non-self polymerizable cross linking agent is used a "mainly identical" structure is formed including 50% or more of the linking cites being identical and the structural similarities of the nanotubes, functional groups, and cross linking agents one of ordinary skill would expect that 50% or more of the cross linking sites are the same in Tennent (meeting the limitation of claim 1) as in the instant invention. No patentable distinction is seen.

7. Tennent teaches the use of the nanotube structure taught by Tennent as an electrode within a two electrode system (see figures 1 and 2 and abstract), but does not appear to teach the three or more electrodes claimed by applicant.

8. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the nanotubes as disclosed in Tennent in the (FET) of Bethune as a insulating layer (transporter layer) because Bethune teaches the desire to provide a

nanotube material capable of storing at least one electron in order to overcome the gate (electrode) voltage barrier and carry a current between the source (electrode) and drain (electrode) (see figures and abstract and claim 1 Bethune) and the material of Tennent is used in the capacitor to store electrical energy (electrons) and release it when at a determined electrical state (substantially similar to the system conditions of a barrier voltage) and therefore would be expected to function in the manner desired by Bethune to transport current once a voltage barrier is overcome. No patentable distinction is seen.

9. Regarding claims 3 and 4, Bethune teaches the (FET) can be especially useful for MOS-FET (FET's), but can be used in a variety of other similar electrical applications, such as memory devices, therefore it would have been obvious to one of ordinary skill to employ the nanotube layer in the well known MES-FET electrical configuration with the same functionality as taught by Bethune and achieve substantially similar benefits (see column 1 Bethune). No patentable distinction is seen.

10. Regarding claims 9-14, it should be noted that, "even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim (or limitation) is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.", (In re Thorpe, 227 USPQ 964,966). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a

Art Unit: 1794

different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product (In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983), MPEP 2113). Therefore, differentiations in the process do not create a patentable distinction absent the showing that the end product is the same. The examiner need only show the claimed cross-linking agents were or are taught, not that the article was subject to "curing" a solution of carbon nanotubes, as claimed by applicant. In the instant case no patentable distinction is found.

11. Regarding claim 15-16, the nanotubes are bonded and the reaction that linked the nanotubes would necessarily be encompassed by one of the reaction types enumerated by applicant.

12. Regarding claims 17-19, the carbon nanotubes structure are patterned to form a "transporting layers" between the source and drain electrodes, the substrate is considered to be inherently "flexible" to some degree and the nanotubes and electrodes are considered to be integrated on to said substrate (see figures Bethune).

13. Further the functional groups and cross-linking agents would inherently form applicant's claimed structures of claims 1 and 12-14 (See above and examples from Tennent).

14. Alternatively; regarding the limitation of claim 1 requiring specific linking agents it would have been obvious to one of ordinary skill in the art at the time of the invention to provide cross linking sites having hydrocarbons anywhere from 2-10, 2-5, or 2-3 carbon atoms because Tennent teaches multiple embodiments where the attachment site

Art Unit: 1794

would necessarily include 2-3 carbon atom structures, including other examples wherein quinine (having six carbon atoms) is part of the functional group, and other examples wherein the cross-linking agent and or functional groups and include an R group that can be any alkyl groups having any number of carbons (see examples); it would have been obvious to include hydrocarbons having the claimed structure in the linking site (as claimed) in order to provide optimal electrical properties to the network structure for the desired application including providing polyamines or polyols (as taught by both Tennent and the instant spec.) that provide for optimal electrical properties (i.e. storage of electrical charge). Further, absent a showing of criticality a wide variety of chemically structures, consistent with the taught structures, would have been obvious to employ and would have been expected by one of ordinary skill to be successfully employed to provide an advantageous electrical configurations. No patentable distinction is seen.

Response to Arguments

15. Applicant's arguments filed 9/8/2009 have been fully considered but they are not persuasive.
16. Applicant has argued that Bethune does not teach a "transported layer" as claimed in the instant invention. The Examiner disagrees. The term "transported layer" as claimed in the instant invention has been properly given its broadest reasonable

Art Unit: 1794

interpretation for purposes of examination. The layer of Bethune is in a FET as in the instant invention and appears to function in substantially the same way as applicant's claimed invention. Applicant seems to argue that electrons travel to the layer of Bethune and are stored. It is not clear whether applicant is asserting that those electrons are permanently stored there and never move. Nor is it clear what the functional difference is. No patentable distinction is seen between the claimed layer and Bethune.

17. The argument made by applicant that Bethune teaches away from the bonds of Tennent is also unconvincing. Just because Bethune does not teach functionalized structure does not amount to a specific teaching away from the combination.

18. Further the functional groups and cross-linking agents would inherently form applicant's claimed structures of claims 1 and 12-14 (See above and examples from Tennent).

19. Alternatively; regarding the limitation of claim 1 requiring specific linking agents it would have been obvious to one of ordinary skill in the art at the time of the invention to provide cross linking sites having hydrocarbons anywhere from 2-10, 2-5, or 2-3 carbon atoms because Tennent teaches multiple embodiments where the attachment site would necessarily include 2-3 carbon atom structures, including other examples wherein quinine (having six carbon atoms) is part of the functional group, and other examples wherein the cross-linking agent and or functional groups and include an R group that can be any alkyl groups having any number of carbons (see examples); it would have been obvious to include hydrocarbons having the claimed structure in the linking site (as claimed) in order to provide optimal electrical properties to the network structure for the

Art Unit: 1794

desired application including providing polyamines or polyols (as taught by both Tennent and the instant spec.) that provide for optimal electrical properties (i.e. storage of electrical charge). Further, absent a showing of criticality a wide variety of chemically structures, consistent with the taught structures, would have been obvious to employ and would have been expected by one of ordinary skill to be successfully employed to provide an advantageous electrical configurations. No patentable distinction is seen.

20. Rejection maintained.

Conclusion

21. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Art Unit: 1794

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL MILLER whose telephone number is (571)272-1534. The examiner can normally be reached on M-Th.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Sample can be reached on (571)272-1376. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/David R. Sample/
Supervisory Patent Examiner, Art Unit 1794

Daniel Miller